(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 June 2004 (17.06.2004)

PCT

(10) International Publication Number
WO 2004/051070 A1

(51) International Patent Classification[7]: F02M 37/22

(21) International Application Number:
PCT/EP2003/012059

(22) International Filing Date: 24 October 2003 (24.10.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
RE2002A000094 3 December 2002 (03.12.2002) IT

(71) Applicant *(for all designated States except US)*: **UFI FILTERS S.P.A.** [IT/IT]; 26, Via Europa, I-46047 Porto Mantovano (IT).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **GIRONDI, Giorgio** [IT/IT]; 14, Vicolo Carbone, I-46100 Mantova (IT).

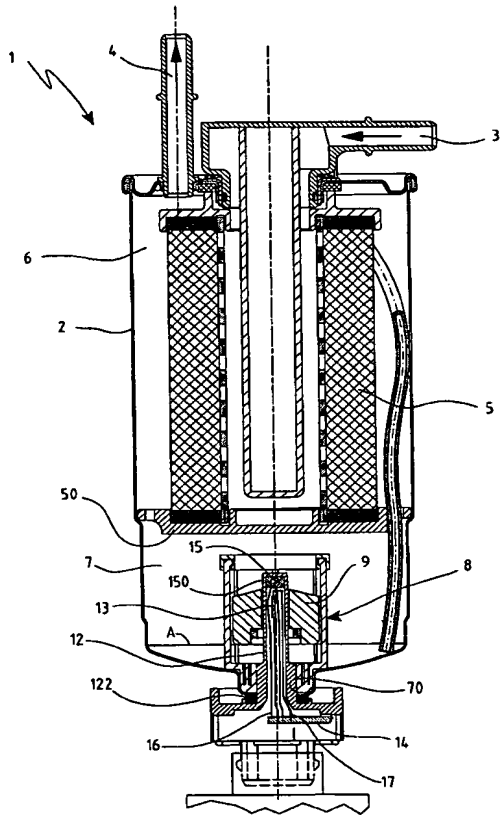
(74) Agents: **CORRADINI, Corrado** et al.; 4, Via Dante Alighieri, I-42100 Reggio Emilia (IT).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: FUEL FILTER FOR DIESEL ENGINES WITH HIGH PRESSURE DIRECT INJECTION OF COMMON RAIL TYPE AND THE LIKE



(57) Abstract: Fuel filter for diesel engines with high pressure direct injection of common rail type and the like, comprising an outer casing provided with a fuel inlet conduit (3) and an outlet conduit (4), and containing in its interior a filter means(5), a temperature sensor(15) being positioned in proximity to the bottom of said casing to measure the temperature of the fuel present in the casing.

WO 2004/051070 A1

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations*

Published:

— *with international search report*

— *with amended claims*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

CLAIMS

1. A fuel filter for diesel engines with high pressure direct injection of common rail type and the like, comprising an outer casing provided with a fuel inlet conduit (3) and an outlet conduit (4), and internally housing a filter means, characterised in that a temperature sensor (15) is positioned in the lower part of said casing to measure the temperature of the fuel present in the casing.

2. A filter as claimed in claim 1, characterised in that said casing presents an upper chamber (6) for containing said filter means, and a lower chamber (7) communicating with said upper chamber to collect the water which said filter means (5) separates from the fuel, means (8) for measuring the level of the water collected in the chamber (7) being associated with said lower chamber.

3 A filter as claimed in claim 2 characterised in that said temperature sensor is associated with said means for measuring the water in the chamber (7).

4 A filter as claimed in claim 2 characterised in that said water level measurement means comprise a sensor positioned in the collection chamber to generate an electrical signal when the water level reaches a predetermined maximum value, said signal being fed to an electronic card.

5 A filter as claimed in claim 4 characterised in that said sensor means comprises a float positioned in the collection chamber and having a specific gravity between the specific gravity of water and that of the fuel, and a float guide stem in the interior of which there is positioned a magnetic field sensor connected electrically to said electronic card by two conductors.

6 A filter as claimed in claim 5 characterised in that said temperature sensor is positioned in the interior of said stem in proximity to its free end, and is connected electrically to said card by two conductors.

7 A filter as claimed in claim 6 characterised in that one of the conductors connecting said temperature sensor to said card is also connected to said magnetic field sensor.

8 A filter as claimed in claim 1, characterised in that said temperature sensor is of NTC type.

9 A filter as claimed in claim 1, characterised in that said temperature sensor is embedded in a layer of conductive resin.

AMENDED CLAIMS
[received by the International Bureau on 21 April 2004 (21.04.04); original claims 1-5 replaced by new claims 1-5; original claims 6-9 cancelled; (2 pages)]

1. A fuel filter for diesel engines with high pressure direct injection of common rail type and the like, comprising an outer casing provided with a fuel inlet conduit (3) and an outlet conduit (4), and internally housing a filter means, said casing comprising an upper chamber (6) for containing said filter means, a lower chamber (7) communicating with said upper chamber to collect the water which said filter means (5) separates from the fuel, and means (8) for measuring the level of the water collected in the lower chamber (7), characterised in that said means for measuring the water level in the chamber (7) comprise a temperature sensor for generating an electrical signal, said signal being fed to an electronic card by two conductors.

2 A filter as claimed in claim 1 characterised in that said level sensor means comprises a float positioned in the collection chamber and having a specific gravity between the specific gravity of water and that of the fuel, and a float guide stem in the interior of which there is positioned a magnetic field sensor connected electrically to said electronic card by two conductors, said temperature sensor means being positioned in the interior of said stem in proximity to its upper free end.

3 A filter as claimed in claim 2 characterised in that one of the conductors connecting said temperature sensor means to said card is also connected to said magnetic field sensor.

4 A filter as claimed in claim 1, characterised in that said temperature sensor is of NTC type.

5 A filter as claimed in claim 1, characterised in that said temperature sensor is embedded in a layer of conductive resin.

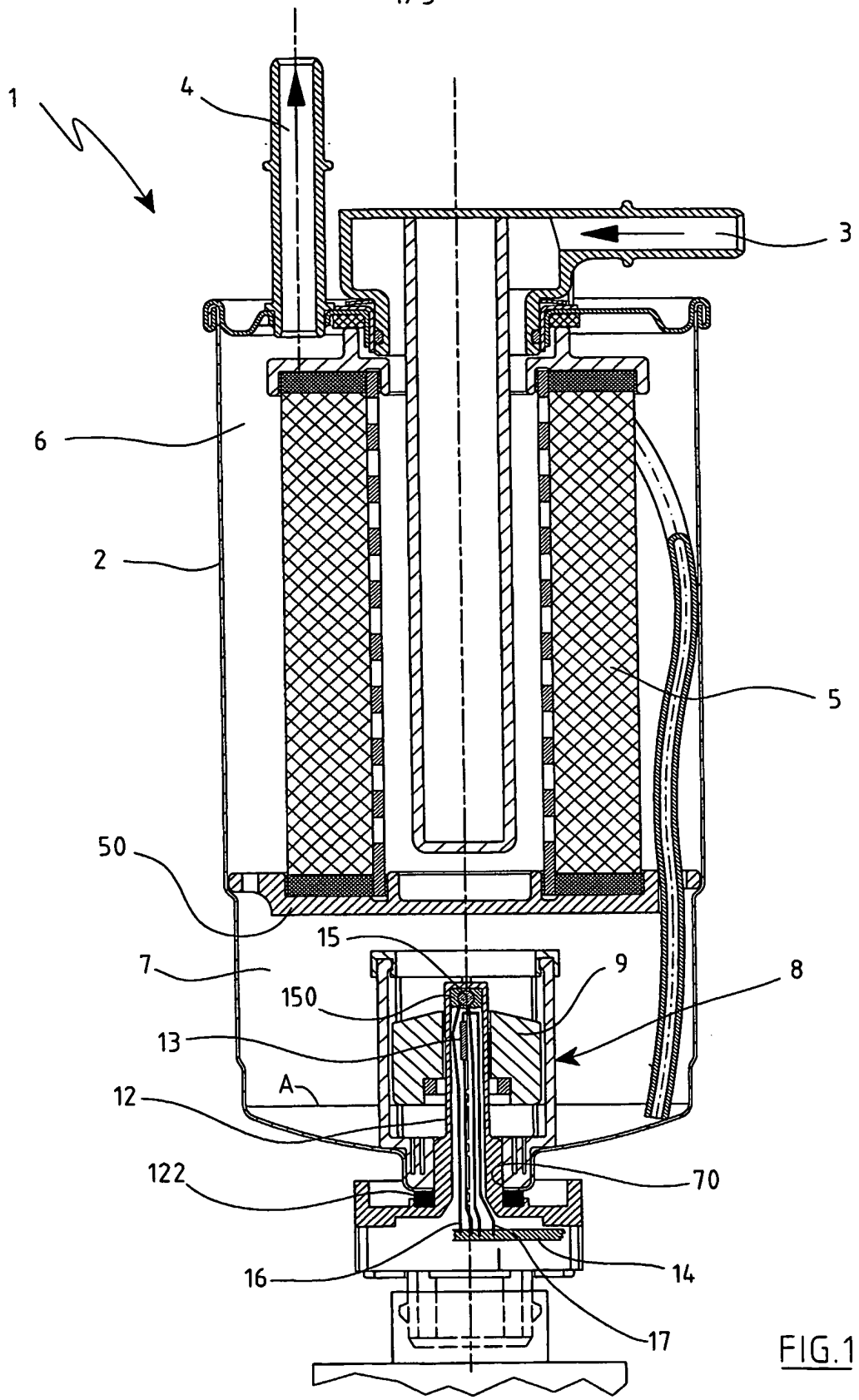


FIG.1

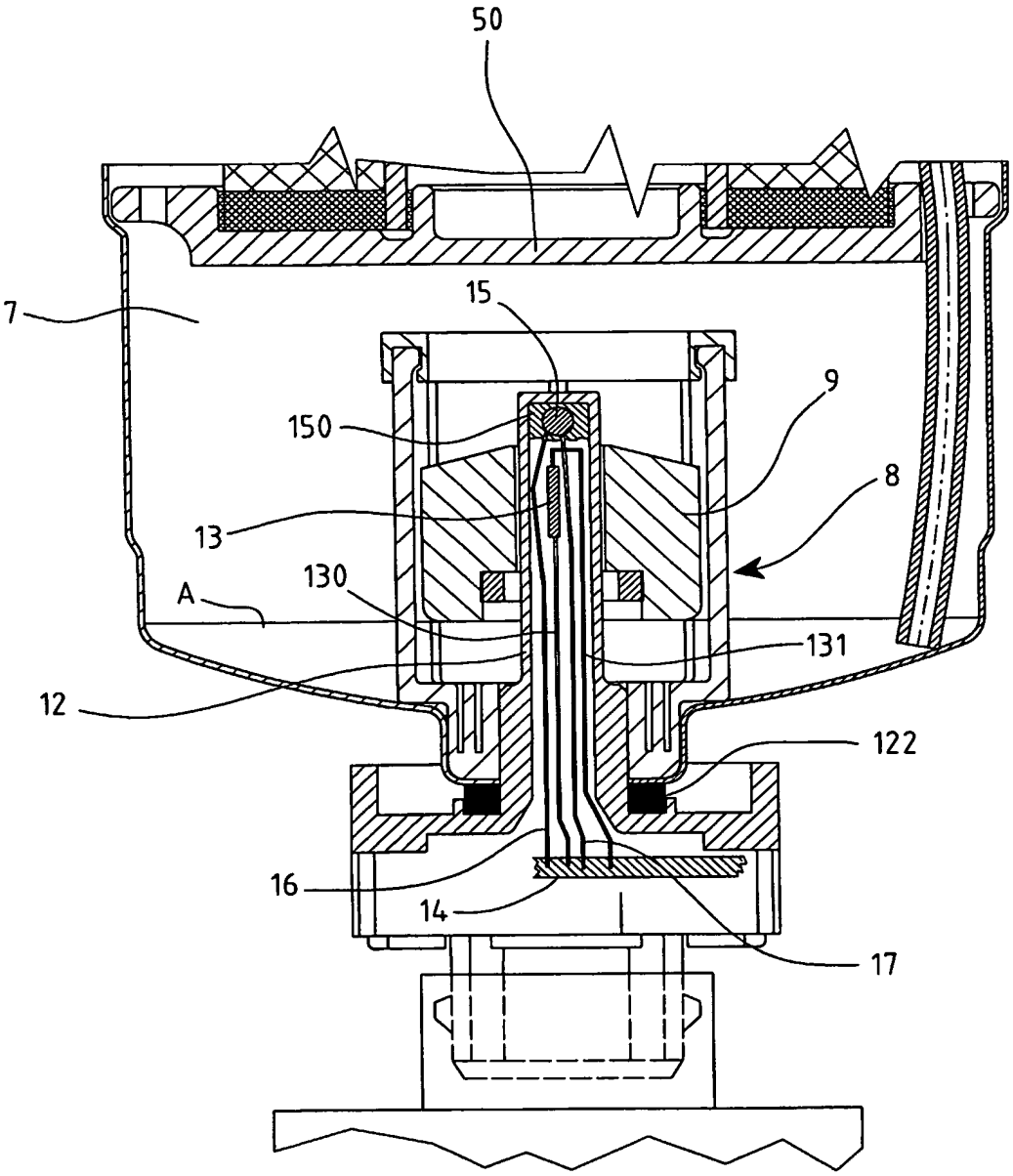


FIG.2

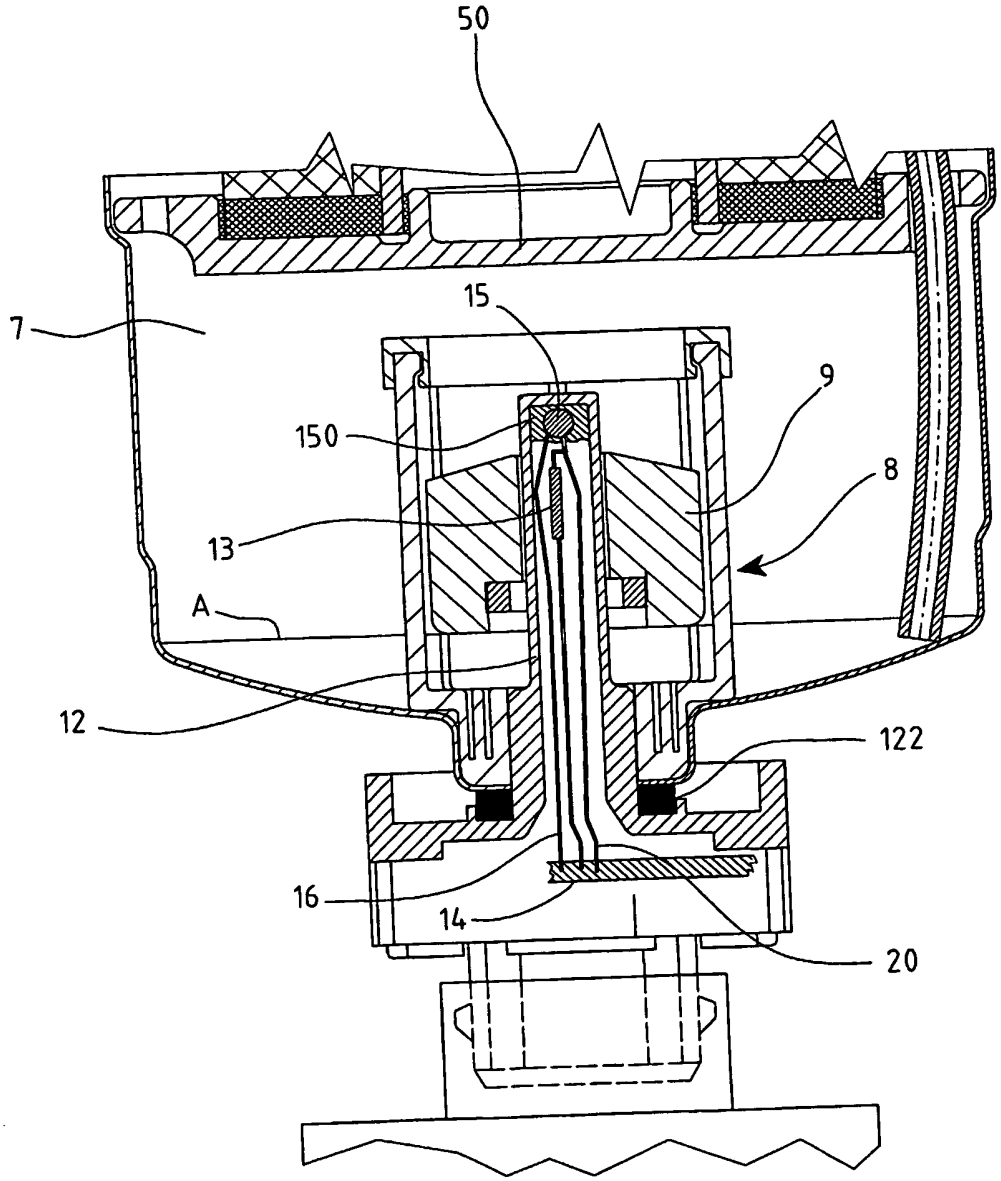


FIG.3

FUEL FILTER FOR DIESEL ENGINES WITH HIGH PRESSURE DIRECT INJECTION OF COMMON RAIL TYPE AND THE LIKE

ABSTRACT

Fuel filter for diesel engines with high pressure direct injection of common rail type and the like, comprising an outer casing provided with a fuel inlet conduit (3) and an outlet conduit (4), and containing in its interior a filter means (5), a temperature sensor (15) being positioned in proximity to the bottom of said casing to measure the temperature of the fuel present in the casing.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 03/12059

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F02M37/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 F02M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 580 542 A (KAWABATA) 8 April 1986 (1986-04-08) the whole document	1,2,4,5, 9
X	US 4 321 136 A (MATSUI) 23 March 1982 (1982-03-23) the whole document	1-4
X	US 4 680 110 A (DAVIS) 14 July 1987 (1987-07-14) column 4, line 24 -column 5, line 47; figures 3,4	1,2

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 February 2004	25/02/2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Van Zoest, A

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 03/12059

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4580542 A	08-04-1986	NONE	
US 4321136 A	23-03-1982	JP 56004653 U	16-01-1981
		CA 1137842 A1	21-12-1982
US 4680110 A	14-07-1987	US 4539109 A	03-09-1985
		AT 50834 T	15-03-1990
		CA 1262871 A1	14-11-1989
		DE 3576386 D1	12-04-1990
		EP 0168160 A1	15-01-1986
		JP 61019966 A	28-01-1986
		US 4676895 A	30-06-1987
		CA 1245569 A1	29-11-1988
		EP 0150120 A2	31-07-1985
		JP 60159362 A	20-08-1985